

# PATENT ABSTRACTS OF JAPAN

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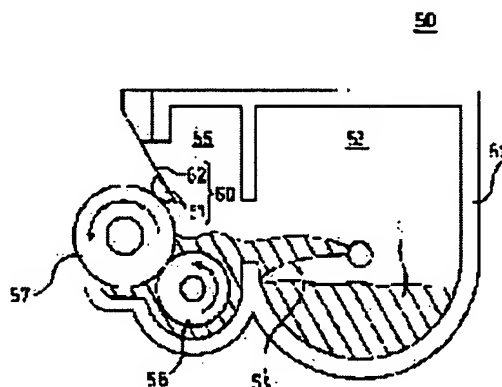
## (54) IMAGE FORMING DEVICE AND DEVELOPING CARTRIDGE

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide an image forming device capable of forming good images and well reducing a running cost by using silicone rubber in constituting a layer thickness regulating means.

**SOLUTION:** A developing device cartridge 50 constituted exchangeably separately from a photosensitive drum of a laser printed is formed with a toner housing chamber 53 in a case 52. Toners T transported to the surface of a developing roller 57 via a feed roller 56 are regulated to a prescribed layer thickness by the layer thickness regulating blade 60 and are thereafter transported to the surface of the photosensitive drum so as to be rendered to

development. The layer thickness regulating blade 60 is formed by constituting a pressing member 61 coming into direct contact with the toners T on the developing roller 57 by the silicone rubber and, therefore, the toners T are well electrostatically charged. Since the polymerized toners approximate to a spherical shape are used as toners T, the wear of the silicone rubber constituting the pressing member 61 may be suppressed.



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CLAIMS

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[Claim(s)]

[Claim 1] The electrostatic latent image bearing body with which an electrostatic latent image is formed in a front face, and a development means to convey a developer on the front face of this electrostatic latent image bearing body, and to develop the above-mentioned electrostatic latent image, The above-mentioned developer which adheres to the front face of this development means, and is conveyed to the front face of the above-mentioned electrostatic latent image bearing body is contacted. It is image formation equipment which is equipped with a layer-thickness-regulation means to regulate the thickness of the developer, imprints the developer which developed the above-mentioned electrostatic latent image to recorded media, and forms an image. Image formation equipment characterized by constituting the above-mentioned developer with a polymerization toner while silicone rubber constitutes the part of the above-mentioned layer-thickness-regulation means which contacts the above-mentioned developer at least.

[Claim 2] Image formation equipment according to claim 1 which adds at least two kinds of external additives with which particle size differs in the above-mentioned developer, and is characterized by the BET specific surface areas by the nitrogen adsorption in connection with the above-mentioned external additive of a side with a large particle size being under 100m<sup>2</sup> / g.

[Claim 3] Image formation equipment according to claim 1 or 2 characterized by constituting this cartridge exchangeable [ the above-mentioned electrostatic latent image bearing body ] on another object while containing the above-mentioned development means and the above-mentioned layer-thickness-regulation means to the cartridge of one with a developer maintenance means to hold the intact above-mentioned developer.

[Claim 4] The electrostatic latent image bearing body with which an electrostatic latent image is formed in a front face, and a development means to convey a developer on the front face of this electrostatic latent image bearing body, and to develop the above-mentioned electrostatic latent image, The above-mentioned developer which adheres to the front face of this development means, and is conveyed to the front face of the above-mentioned electrostatic latent image bearing body is contacted. It is image formation equipment which is equipped with a layer-thickness-regulation means to regulate the thickness of the developer, imprints the developer which developed the above-mentioned electrostatic latent image to recorded media, and forms an image. While silicone rubber constitutes the part of the above-mentioned layer-thickness-regulation means which contacts the above-mentioned developer at least Image formation equipment characterized by having contained the above-mentioned development means and the above-mentioned layer-thickness-regulation means to the cartridge of one with a developer maintenance means to hold the intact above-mentioned developer, and constituting this cartridge exchangeable on another object with the above-mentioned electrostatic latent image bearing body.

[Claim 5] A development means to convey a developer on the front face of the electrostatic latent image bearing body of image formation equipment, and to develop the electrostatic latent image, The above-mentioned developer which adheres to the front face of this development means, and is conveyed to the

front face of the above-mentioned electrostatic latent image bearing body is contacted. Are the development cartridge equipped with a layer-thickness-regulation means to regulate the thickness of the developer, and while containing the above-mentioned development means and the above-mentioned layer-thickness-regulation means to one with a developer maintenance means to hold the intact above-mentioned developer The development cartridge characterized by having been constituted exchangeable [ the above-mentioned electrostatic latent image bearing body ] on another object, and constituting the part of the above-mentioned layer-thickness-regulation means which contacts the above-mentioned developer at least with silicone rubber to the above-mentioned image formation equipment.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention develops the electrostatic latent image formed in the front face of an electrostatic latent image bearing body in detail about the usable development cartridge with the electrified developer to the image formation equipment which imprints a developer to recorded media and forms an image, and its equipment, and relates to an usable development cartridge to the image formation equipment which imprints the developer to recorded media, and its equipment.

[0002]

[Description of the Prior Art] The thing equipped with a development means convey a developer as this kind of image formation equipment conventionally on the front face of the electrostatic latent image bearing body with which an electrostatic latent image is formed in a front face, and this electrostatic latent image bearing body, and develop the above-mentioned electrostatic latent image, and a layer-thickness-regulation means contact the above-mentioned developer which adheres to the front face of this development means, and is conveyed to the front face of the above-mentioned electrostatic latent image bearing body, and regulate the thickness of that developer is considered. Thus, with the constituted image formation equipment, the electrostatic latent image according to a desired image is formed in the front face of an electrostatic latent image bearing body. Although a development means conveys a developer on the front face of the electrostatic latent image bearing body and develops an electrostatic latent image, a layer-thickness-regulation means contacts the developer conveyed to the front face of an electrostatic latent image bearing body by the development means, and it regulates the thickness of a developer to it. Moreover, a developer is charged by contact of this layer-thickness-regulation means, and it comes to adhere with electrostatic attraction to the above-mentioned electrostatic latent image. For this reason, a developer is made to adhere to the above-mentioned electrostatic latent image by uniform thickness, and it becomes possible to imprint it to recorded media and to form a clear image.

[0003] It considers using the layer-thickness-regulation blade which the electrification nature to developers, such as a toner, was excellent in as this layer-thickness-regulation means, and was made suitable [ what can prevent a bury lump of the external additive in a developer by moreover having moderate softness ], for example, was constituted with silicone rubber. Thus, when silicone rubber constitutes a layer-thickness-regulation blade, the developer of straight polarity can also be electrified in homogeneity good [ the developer of negative polarity ], further, a bury lump of the external additive to a developer mother particle can be prevented, and the fluidity of the developer can be secured good. For this reason, the good image which has neither fogging nor ill-behaved \*\* in printing can be formed.

[0004]

[Problem(s) to be Solved by the Invention] However, it is tended to wear silicone rubber out, and while contacting developers, such as a toner, and carrying out frictional electrification of the developer, it will be easily worn out. In order to maintain the fluidity of a developer especially, when the BET specific surface area by the nitrogen adsorption which is hard being buried with a developer mother particle uses

the large external additive of under  $100\text{m}^2/\text{g}$ , the life of a layer-thickness-regulation blade becomes [ wear of silicone rubber ] short early. Moreover, since it unites with development means, such as electrostatic latent image bearing bodies, such as a photoconductor drum, and a developing roller, and the layer-thickness-regulation blade constitutes one cartridge, they must be exchanged the whole cartridge at the time of wear of a layer-thickness-regulation blade. For this reason, with this kind of image formation equipment, the running cost was high.

[0005] Then, this invention was made for the purpose of offering the image formation equipment which can reduce a running cost good while forming the good image by constituting a layer-thickness-regulation means using silicone rubber.

[0006]

[The means for solving a technical problem and an effect of the invention] Invention according to claim 1 made since the above-mentioned object was attained The electrostatic latent image bearing body with which an electrostatic latent image is formed in a front face, and a development means to convey a developer on the front face of this electrostatic latent image bearing body, and to develop the above-mentioned electrostatic latent image, The above-mentioned developer which adheres to the front face of this development means, and is conveyed to the front face of the above-mentioned electrostatic latent image bearing body is contacted. It is image formation equipment which is equipped with a layer-thickness-regulation means to regulate the thickness of the developer, imprints the developer which developed the above-mentioned electrostatic latent image to recorded media, and forms an image. While silicone rubber constitutes the part of the above-mentioned layer-thickness-regulation means which contacts the above-mentioned developer at least, it is characterized by constituting the above-mentioned developer with a polymerization toner.

[0007] Thus, in constituted this invention, since silicone rubber constitutes the part of a layer-thickness-regulation means which contacts a developer at least, while electrifying a developer in homogeneity good as mentioned above, the fluidity of a developer can also be secured good and the good image which has neither fogging nor ill-behaved \*\* in printing can be formed. Moreover, the polymerization toner constitutes the developer from this invention. It is thought that a polymerization toner has near and a very good fluidity very spherically compared with other grinding toners etc. For this reason, it can control wearing silicone rubber out as mentioned above good, and the running cost of image formation equipment can be reduced good. Therefore, with the image formation equipment of this invention, while forming a good image, a running cost can be reduced good.

[0008] In addition, when the above-mentioned polymerization toner is a suspension-polymerization toner obtained according to the suspension polymerization, the still more nearly following effectiveness arises. It is thought that the suspension-polymerization toner obtained according to the suspension polymerization has near and a much more good fluidity much more spherically also among polymerization toners. Therefore, wear of silicone rubber can be controlled much more good in this case, and the running cost of image formation equipment can be reduced much more good.

[0009] In addition to a configuration according to claim 1, invention according to claim 2 adds at least two kinds of external additives with which particle size differs in the above-mentioned developer, and is characterized by the BET specific surface areas by the nitrogen adsorption in connection with the above-mentioned external additive of a side with a large particle size being under  $100\text{m}^2/\text{g}$ .

[0010] In this invention, at least two kinds of external additives with which particle size differs in a developer are added. For this reason, when the external additive of a large side functions as a spacer, it can control that prevent that other developers contact directly the external additive by the side of [ large ] it, and the external additive of the small side added by the same developer, and the external additive by the side of [ small ] it is buried with a developer. Moreover, since the BET specific surface areas by nitrogen adsorption are under  $100\text{m}^2/\text{g}$ , the function which controls account the bury lump of a top is demonstrated much more good, and the external additive of a large side can secure the fluidity of a developer much more good. As mentioned above, since wear of silicone rubber became early, it was difficult, but in this invention, since the above-mentioned wear was controlled as mentioned above using the polymerization toner, it became possible [ using a big external additive in this way ] to use a big

external additive in this way conventionally.

[0011] Therefore, in addition to an effect of the invention according to claim 1, in this invention, the effectiveness that a much more good image can be formed arises. Invention according to claim 3 is characterized by constituting this cartridge exchangeable [ the above-mentioned electrostatic latent image bearing body ] on another object while it contains the above-mentioned development means and the above-mentioned layer-thickness-regulation means to the cartridge of one with a developer maintenance means to hold the intact above-mentioned developer in addition to a configuration according to claim 1 or 2.

[0012] In this invention, the layer-thickness-regulation means is contained to the cartridge of one with the developer maintenance means and the above-mentioned development means of holding an intact developer, and the electrostatic latent image bearing body of this cartridge is exchangeable on another object. For this reason, even if it wears a layer-thickness-regulation means out, this layer-thickness-regulation means can be exchanged for a new thing with a developer, and, moreover, an electrostatic latent image bearing body can use succeedingly what has been used till then. Therefore, also when a layer-thickness-regulation means is worn out, the exchange is easy, and even an electrostatic latent image bearing body usable moreover succeedingly is not exchanged.

[0013] Therefore, in this invention, while making exchange of a layer-thickness-regulation means easy in addition to an effect of the invention according to claim 1 or 2, the effectiveness that a running cost can be reduced much more good arises. The electrostatic latent image bearing body with which, as for invention according to claim 4, an electrostatic latent image is formed in a front face, A development means to convey a developer on the front face of this electrostatic latent image bearing body, and to develop the above-mentioned electrostatic latent image, The above-mentioned developer which adheres to the front face of this development means, and is conveyed to the front face of the above-mentioned electrostatic latent image bearing body is contacted. It is image formation equipment which is equipped with a layer-thickness-regulation means to regulate the thickness of the developer, imprints the developer which developed the above-mentioned electrostatic latent image to recorded media, and forms an image. While silicone rubber constitutes the part of the above-mentioned layer-thickness-regulation means which contacts the above-mentioned developer at least It is characterized by having contained the above-mentioned development means and the above-mentioned layer-thickness-regulation means to the cartridge of one with a developer maintenance means to hold the intact above-mentioned developer, and constituting this cartridge exchangeable on another object with the above-mentioned electrostatic latent image bearing body.

[0014] Thus, in constituted this invention, since silicone rubber constitutes the part of a layer-thickness-regulation means which contacts a developer at least, while electrifying a developer in homogeneity good as mentioned above, the fluidity of a developer can also be secured good and the good image which has neither fogging nor ill-behaved \*\* in printing can be formed. Moreover, in this invention, it has contained to the cartridge of one with a developer maintenance means to hold an intact developer for a layer-thickness-regulation means, and a development means to convey a developer on the front face of an electrostatic latent image bearing body, and the electrostatic latent image bearing body of this cartridge is exchangeable on another object. For this reason, even if it wears a layer-thickness-regulation means out, this layer-thickness-regulation means can be exchanged for a new thing with a developer, and, moreover, an electrostatic latent image bearing body can use succeedingly what has been used till then.

[0015] Therefore, in this invention, also when a layer-thickness-regulation means is worn out, the exchange is easy, and since even an electrostatic latent image bearing body usable moreover succeedingly is not exchanged, the running cost of image formation equipment can be reduced good. That is, with the image formation equipment of this invention, while forming a good image by constituting a layer-thickness-regulation means using silicone rubber, a running cost can be reduced good.

[0016] A development means for invention according to claim 5 to convey a developer on the front face of the electrostatic latent image bearing body of image formation equipment, and to develop the

electrostatic latent image, The above-mentioned developer which adheres to the front face of this development means, and is conveyed to the front face of the above-mentioned electrostatic latent image bearing body is contacted. Are the development cartridge equipped with a layer-thickness-regulation means to regulate the thickness of the developer, and while containing the above-mentioned development means and the above-mentioned layer-thickness-regulation means to one with a developer maintenance means to hold the intact above-mentioned developer With the above-mentioned electrostatic latent image bearing body, it is characterized by having been constituted by another object exchangeable and constituting the part of the above-mentioned layer-thickness-regulation means which contacts the above-mentioned developer at least with silicone rubber to the above-mentioned image formation equipment.

[0017] Thus, constituted this invention has contained to one a development means to convey a developer on the front face of the electrostatic latent image bearing body of image formation equipment, and to develop the electrostatic latent image, and a layer-thickness-regulation means to contact the developer which adheres to the front face of the development means, and is conveyed to the front face of the above-mentioned electrostatic latent image bearing body, and to regulate the thickness of the developer, with a developer maintenance means to hold the intact above-mentioned developer. This invention is constituted by another object exchangeable with the above-mentioned electrostatic latent image bearing body to the above-mentioned image formation equipment, and, moreover, the part of a layer-thickness-regulation means which contacts a developer at least is constituted by silicone rubber.

[0018] For this reason, this invention can be used good as a cartridge for exchange to image formation equipment according to claim 4. Therefore, if this invention is used combining invention according to claim 4, an effect of the invention according to claim 4 will be demonstrated much more notably.

[0019]

[Embodiment of the Invention] Next, the gestalt of operation of this invention is explained with a drawing. Drawing 1 is a sectional view which expresses roughly the configuration of the laser beam printer 1 as image formation equipment with which this invention was applied. This laser beam printer 1 is equipped with the feeder unit 20 which supplies the form P as recorded media to the pars basilaris ossis occipitalis of the body case 2 as shown in drawing 1. The feeder unit 20 is equipped with the form press plate 22 which carries out laminating maintenance of the form P, the feed roller 23 which performs the supply of Form P by which laminating maintenance was carried out, and compression-spring 22a which turns the form press plate 22 to the feed roller 23, and energizes it, and supplies the top form P by which laminating maintenance was carried out to predetermined timing to the form press plate 22.

[0020] Form P is conveyed to predetermined timing to the imprint location which the resist rollers 24a and 24b of a couple are formed in the form conveyance direction downstream of the feed roller 23 pivotable, and is formed in it with the photoconductor drum 25 mentioned later and the imprint roller 32. The photoconductor drum 25 as an electrostatic latent image bearing body consists of an organic photoconductor which uses a positive triboelectric charging ingredient, for example, a positive triboelectric charging polycarbonate, as a principal component. The photoconductor drum 25 consisted of gestalten of this operation by forming in the periphery of the cylinder sleeve of being cylindrical and the product made from aluminum the photoconductive layer of the given thickness (for example, about 20 micrometers) which made the polycarbonate distribute photoconductivity resin. Opposite arrangement of the electrification machine 26 is carried out at a photoconductor drum 25, and laser beam L from the laser scanner unit 27 is irradiated by the hand-of-cut downstream of the photoconductor drum 25.

[0021] The electrification machine 26 is a scorotron mold electrification machine for forward electrification made to generate corona discharge from the wire for electrification which consists of a tungsten etc., and just electrifies the front face of a photoconductor drum 25. Moreover, the laser scanner unit 27 is equipped with the polygon mirror (5 face-piece mirror) 28 by which revolution actuation is carried out while reflecting laser beam L which the laser generator which is not illustrated generated, the lenses 30a and 30b of a couple, and the mirrors 31a and 31b of a couple, and carries out scan exposure of the front face of a photoconductor drum 25 by laser beam L according to the image which should be formed. Thus, if an electrostatic latent image is formed in a photoconductor drum 25 of having two



incomes with the electrification machine 26 and the laser scanner unit 27, the electrostatic latent image will be developed with the toner T as a developer supplied from the below-mentioned development counter cartridge 50 (equivalent to a development cartridge according to claim 5 like the after-mentioned). And an image is formed in Form P when the form P with which this toner T was conveyed to the above-mentioned imprint location between a photoconductor drum 25 and the imprint roller 32 imprints.

[0022] After the form P after image formation is inserted into the roller 33 for heating, and the press roller 34 and the image by the above-mentioned toner T is fixed to it, it is conveyed with the conveyance rollers 35a and 35b of a couple, and the delivery rollers 36a and 36b of a couple, and is discharged by the paper output tray 37 prepared in the top face of the body case 2.

[0023] Next, the configuration of the development counter cartridge 50 is explained using the enlarged drawing of drawing 2. As shown in drawing 2, as for the development counter cartridge 50, the toner hold room 53 as a developer maintenance means is formed in a case 52, and the agitator 54 which stirs Toner T, and the toner T as a positive triboelectric charging nonmagnetic 1 component developer are held in the toner hold room 53. The processing laboratory 55 which develops negatives is formed in the next door side of the toner hold room 53, and the feed roller 56 and the developing roller 57 ( $\phi 16\text{mm}$ ) as a development means are formed pivotable in the processing laboratory 55. After the toner T conveyed on the front face of a developing roller 57 through the feed roller 56 from the toner hold room 53 is regulated by predetermined thickness with the layer-thickness-regulation blade 60 as a layer-thickness-regulation means, it is conveyed on the front face of a photoconductor drum 25 shown in drawing 1, and development is presented with it.

[0024] In addition, the layer-thickness-regulation blade 60 is constituted by the press member 61 which contacts the toner T on a developing roller 57 directly, and the flat spring 62 which carries out the pressure welding of the press member 61 to a developing roller 57 by the predetermined pressure. The SUS plate with a thickness of 0.1mm constituted the flat spring 62, and the silicone rubber which has a semicircle cross section with a diameter of 3.5mm constituted the press member 61 from the gestalt of this operation. Moreover, the development counter cartridge 50 consisted of gestalten of this operation exchangeable [ a photoconductor drum 25 ] on another object.

[0025] Thus, in the constituted laser beam printer 1, the press member 61 of the layer-thickness-regulation blade 60 contacts the toner T conveyed to the front face of a photoconductor drum 25, and the thickness of Toner T is regulated to it. Moreover, Toner T is charged by contact of this press member 61, and it adheres with electrostatic attraction to the above-mentioned electrostatic latent image formed in the photoconductor drum 25. For this reason, Toner T is made to adhere to the above-mentioned electrostatic latent image by uniform thickness, and it becomes possible to imprint it in Form P and to form a clear image.

[0026] Moreover, the silicone rubber which constitutes the press member 61 is excellent in the electrification nature to Toner T, and can prevent a bury lump of the external additive in Toner T by moreover having moderate softness. For this reason, while electrifying Toner T in homogeneity good, the fluidity of Toner T is securable good. Therefore, in a laser beam printer 1, the very good image which has neither fogging nor ill-behaved \*\* in printing can be formed.

[0027] However, it is tended to wear silicone rubber out. So, with the gestalt of this operation, the styrene acrylic polymerization toner was used as a toner T. It is thought that a polymerization toner has near and a very good fluidity very spherically compared with other grinding toners etc. Moreover, it is thought that the suspension-polymerization toner obtained according to the suspension polymerization like a styrene acrylic polymerization toner has near and a much more good fluidity much more spherically also among polymerization toners. For this reason, with the gestalt of this operation, it can control good wearing out the silicone rubber which constitutes the press member 61, and the running cost of a laser beam printer 1 can be reduced good.

[0028] Moreover, with the gestalt of this operation, two kinds of external additives with which particle size differs in Toner T were added, and the BET specific surface area by nitrogen adsorption added the comparatively large external additive of under  $100\text{m}^2/\text{g}$  (for example,  $50\text{m}^2/\text{g}$ ) as an external additive

of a side with a large particle size. Here, the effectiveness which adds two kinds of external additives with which particle size differs is explained. As shown in drawing 3, the external additive 91 of a large side controls that prevent that other toner mother particles 95 contact directly the external additive 93 of the small side added by the same toner mother particle 95 as the external additive 91, and the external additive 93 by the side of [ small ] it is buried with the toner mother particle 95 by functioning as a spacer.

[0029] And when the BET specific surface area by nitrogen adsorption uses the thing of under 100m<sup>2</sup>/g as an external additive of a large side, the function which controls account the bury lump of a top is demonstrated much more good, and the fluidity of Toner T can be secured much more good. As mentioned above, since wear of silicone rubber became early, it was difficult, but with the gestalt of this operation, since the above-mentioned wear was controlled as mentioned above using the styrene acrylic polymerization toner, it became possible [ using a big external additive in this way ] to use a big external additive in this way conventionally. Moreover, even if wear takes place, the press member 61 can be easily exchanged like the after-mentioned. Therefore, a very good image can be formed in a laser beam printer 1.

[0030] here, the image quality at the time of boiling and changing various image quality of the example of a comparison which used the grinding toner as a toner T, and magnitude of an external additive is shown in a table 1. In addition, in any case, a toner mother particle is made into the mean particle diameter of 9 micrometers, and the data shown in a table 1 are obtained by the experiment which used the silica as an external additive. Moreover, in an experiment, the whole surface pattern of 4% of printing area was printed by intermittent printing of printing one sheet at 30 seconds. 300g of toners was put in in early stages, and they experimented in addition in 250g for every 10000-sheet printing termination. Toner consumption was 50g per 1000 sheets about.

[0031]

[A table 1]

トナー（平均粒径 9 μm）	外添剤：シリカ	ゴムの磨耗までの印字枚数	10000枚印字時（トナー追加前）の画質
ポリエステル粉碎トナー	BET200:0.6wt% BET50 :1.0wt%	2000枚	
スチレンアクリル重合トナー	BET200:0.6wt% BET150:1.0wt%	34000枚	△：印字がさつき、 露光けりが発生
スチレンアクリル重合トナー	BET200:0.6wt% BET100:1.0wt%	26000枚	△：印字がさつき が発生
スチレンアクリル重合トナー	BET200:0.6wt% BET50 :1.0wt%	15000枚	○

[0032] As shown in a table 1, when a grinding toner was used as a toner T, 2000 sheets were printed and a polymerization toner was used to having worn out the silicone rubber which constitutes the press member 61, and poor printing having occurred, printing of 10000 or more sheets was possible for any case. In addition, the amount of wear of the press member 61 at the time of generating poor printing was about 1.2mm. Moreover, when the printing image quality at the time of printing 10000 sheets (before addition of a toner) was evaluated, and a BET specific surface area used the thing 100m<sup>2</sup> / more than g as a large external additive, the bury lump of an external additive arose and it generated with printing bitterness. Especially when a BET specific surface area used the thing of 150m<sup>2</sup> / g, the imprint nature of Toner T got worse, and the exposure kick (phenomenon as for which the part from which it escapes white is made to black solid since laser beam L does not hit a photoconductor drum 25 in a transfer residual toner's existence part) occurred by the so-called transfer residual toner which remained on the photoconductor drum 25, without Form P imprinting.

[0033] A styrene acrylic polymerization toner is used as a toner T, and the above experimental result shows that it is desirable to exchange Toner T for a new thing with the press member 61 when a BET specific surface area uses it combining the thing of 200m<sup>2</sup> / g and the thing of 50m<sup>2</sup> / g and 10000

sheets are printed further as for the silica of an external additive. In this case, in a laser beam printer 1, very good image quality is maintainable. Moreover, when dispersion in the service condition at the time of a real activity is taken into consideration to the combination of the above-mentioned polymerization toner and an external additive by the experimental result of a table 1, and about 7000 sheets are printed, it is [ be / although / the press member 61 was usable to 15000 sheets, ] desirable to exchange the press member 61.

[0034] Then, the toner T of an amount printable 7000 sheets is held in the toner hold room 53 of the development counter cartridge 50, and it enabled it to exchange the toner T for a feed roller 56, a developing roller 57 and the layer-thickness-regulation blade 60, and one with the gestalt of this operation. Moreover, this exchange can be carried out to a photoconductor drum 25 and another object as mentioned above. For this reason, even if it wears out the press member 61 of the layer-thickness-regulation blade 60, that press member 61 can be easily exchanged for a new thing with Toner T, and it does not exchange to the photoconductor drum 25 usable moreover succeedingly. Therefore, with the gestalt of this operation, while making exchange of the press member 61 easy, the running cost of a laser beam printer 1 can be reduced much more good.

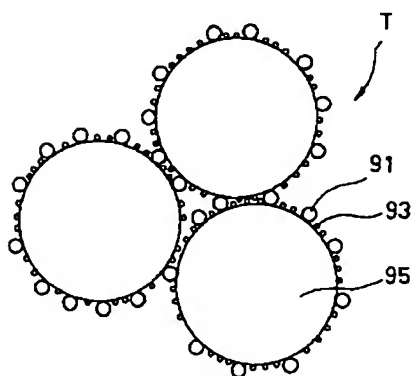
[0035] In addition, this invention is not limited to the gestalt of the above-mentioned implementation at all, and can be carried out with various gestalten in the technical range of this invention. For example, although the toner T as a positive triboelectric charging nonmagnetic 1 component developer was used with the gestalt of the above-mentioned implementation, even if it uses a negative triboelectric charging developer, silicone rubber can electrify the developer in homogeneity good. Therefore, the same operation and effectiveness as the gestalt of the above-mentioned implementation arise also in this case.

[0036] Moreover, this invention is applicable to the image formation equipment using other polymerization toners obtained with the image formation equipment which used polymerization toners other than a suspension-polymerization toner, for example, an emulsion polymerization etc., similarly. The same effectiveness is acquired, although a comparatively good fluidity is acquired and it is a little inferior to the above-mentioned toner T, also when Toner T is considered as such a configuration. Furthermore, when the development counter cartridge 50 is constituted exchangeable as mentioned above, even when a grinding toner is used, duration of service of a photoconductor drum 25 can be lengthened, and a running cost can be reduced to some extent. Furthermore, this invention is applicable not only like a laser beam printer but other equipments which form an image with an electrophotography method like facsimile and a copying machine.

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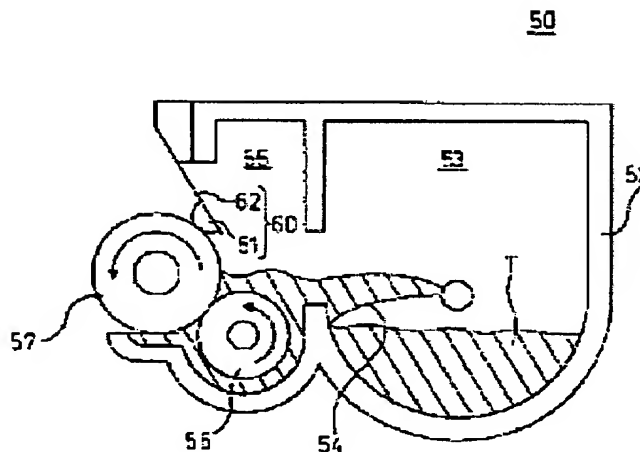


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**IMAGE FORMING DEVICE AND DEVELOPING CARTRIDGE****Publication number:** JP2000275963**Publication date:** 2000-10-06**Inventor:** SATO SHOGO**Applicant:** BROTHER IND LTD**Classification:****- international:** **G03G15/08; G03G15/08;** (IPC1-7): G03G15/08;  
G03G15/08**- European:****Application number:** JP19990084021 19990326**Priority number(s):** JP19990084021 19990326**Report a data error here****Abstract of JP2000275963.**

**PROBLEM TO BE SOLVED:** To provide an image forming device capable of forming good images and well reducing a running cost by using silicone rubber in constituting a layer thickness regulating means. **SOLUTION:** A developing device cartridge 50 constituted exchangeably separately from a photosensitive drum of a laser printed is formed with a toner housing chamber 53 in a case 52. Toners T transported to the surface of a developing roller 57 via a feed roller 56 are regulated to a prescribed layer thickness by the layer thickness regulating blade 60 and are thereafter transported to the surface of the photosensitive drum so as to be rendered to development. The layer thickness regulating blade 60 is formed by constituting a pressing member 61 coming into direct contact with the toners T on the developing roller 57 by the silicone rubber and, therefore, the toners T are well electrostatically charged. Since the polymerized toners approximate to a spherical shape are used as toners T, the wear of the silicone rubber constituting the pressing member 61 may be suppressed.



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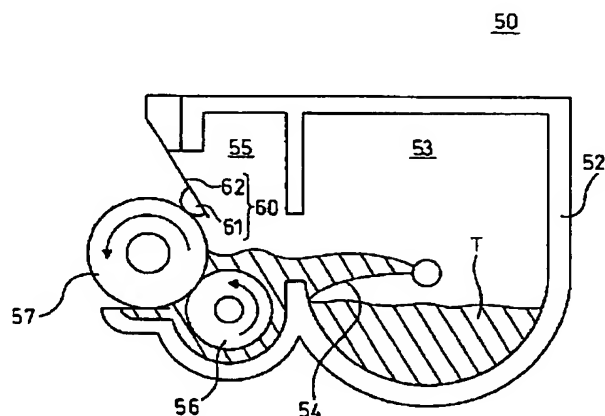
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(54) 【発明の名称】 画像形成装置及び現像カートリッジ

(57) 【要約】

【課題】 層厚規制手段をシリコンゴムを用いて構成することによって良好な画像を形成すると共に、ランニングコストを良好に低減することのできる画像形成装置の提供。

【解決手段】 レーザプリンタの感光ドラムとは別体に交換可能に構成された現像器カートリッジ50には、ケース52内にトナー収容室53が形成され、そこから供給ローラ56を介して現像ローラ57の表面に搬送されたトナーTは、層厚規制ブレード60により所定の層厚に規制された後、上記感光ドラムの表面に搬送されて現像に供される。層厚規制ブレード60は、現像ローラ57上のトナーTに直接接触する押圧部材61をシリコンゴムによって構成したので、トナーTを良好に帯電させる。また、トナーTとして球状に近い重合トナーを使用したので、押圧部材61を構成するシリコンゴムの磨耗が抑制できる。



## 【特許請求の範囲】

【請求項 1】 表面に静電潜像が形成される静電潜像担持体と、

該静電潜像担持体の表面に現像剤を搬送して上記静電潜像を現像する現像手段と、

該現像手段の表面に付着して上記静電潜像担持体の表面まで搬送される上記現像剤に接触して、その現像剤の層厚を規制する層厚規制手段と、

を備え、上記静電潜像を現像した現像剤を被記録媒体に転写して画像を形成する画像形成装置であって、

上記層厚規制手段の少なくとも上記現像剤と接触する部分をシリコンゴムによって構成すると共に、

上記現像剤を重合トナーによって構成したことを特徴とする画像形成装置。

【請求項 2】 上記現像剤に粒径の異なる少なくとも 2 種類の外添剤を添加し、かつ、粒径の大きい側の上記外添剤に関わる窒素吸着による BET 比表面積が  $100 \text{ m}^2/\text{g}$  未満であることを特徴とする請求項 1 記載の画像形成装置。

【請求項 3】 上記現像手段及び上記層厚規制手段を、未使用の上記現像剤を保持する現像剤保持手段と共に一体のカートリッジに収納すると共に、該カートリッジを、上記静電潜像担持体とは別体に交換可能に構成したことを特徴とする請求項 1 または 2 記載の画像形成装置。

【請求項 4】 表面に静電潜像が形成される静電潜像担持体と、

該静電潜像担持体の表面に現像剤を搬送して上記静電潜像を現像する現像手段と、

該現像手段の表面に付着して上記静電潜像担持体の表面まで搬送される上記現像剤に接触して、その現像剤の層厚を規制する層厚規制手段と、

を備え、上記静電潜像を現像した現像剤を被記録媒体に転写して画像を形成する画像形成装置であって、

上記層厚規制手段の少なくとも上記現像剤と接触する部分をシリコンゴムによって構成すると共に、

上記現像手段及び上記層厚規制手段を、未使用の上記現像剤を保持する現像剤保持手段と共に一体のカートリッジに収納し、かつ、該カートリッジを、上記静電潜像担持体とは別体に交換可能に構成したことを特徴とする画像形成装置。

【請求項 5】 画像形成装置の静電潜像担持体の表面に現像剤を搬送してその静電潜像を現像する現像手段と、該現像手段の表面に付着して上記静電潜像担持体の表面まで搬送される上記現像剤に接触して、その現像剤の層厚を規制する層厚規制手段と、

を備えた現像カートリッジであって、

上記現像手段及び上記層厚規制手段を、未使用の上記現像剤を保持する現像剤保持手段と共に一体に収納すると共に、上記画像形成装置に対して、上記静電潜像担持体

とは別体に交換可能に構成され、かつ、上記層厚規制手段の少なくとも上記現像剤と接触する部分をシリコンゴムによって構成したことを特徴とする現像カートリッジ。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】本発明は、現像剤を被記録媒体に転写して画像を形成する画像形成装置及びその装置に対して使用可能な現像カートリッジに関し、詳しく

は、静電潜像担持体の表面に形成された静電潜像を帯電した現像剤によって現像し、その現像剤を被記録媒体に転写する画像形成装置及びその装置に対して使用可能な現像カートリッジに関する。

## 【0002】

【従来の技術】従来より、この種の画像形成装置として、表面に静電潜像が形成される静電潜像担持体と、該静電潜像担持体の表面に現像剤を搬送して上記静電潜像を現像する現像手段と、該現像手段の表面に付着して上記静電潜像担持体の表面まで搬送される上記現像剤に接触して、その現像剤の層厚を規制する層厚規制手段と、を備えたものが考えられている。このように構成された画像形成装置では、静電潜像担持体の表面には、所望の画像に応じた静電潜像が形成される。現像手段は、その静電潜像担持体の表面に現像剤を搬送して静電潜像を現像するが、その現像手段により静電潜像担持体の表面まで搬送される現像剤には、層厚規制手段が接触して現像剤の層厚を規制する。また、この層厚規制手段の接触によって現像剤が帯電し、上記静電潜像に対して静電引力によって付着するようになる。このため、上記静電潜像に均一な厚さで現像剤を付着させ、それを被記録媒体に転写して鮮明な画像を形成することが可能となる。

【0003】この層厚規制手段としては、トナー等の現像剤に対する帯電性が優れ、しかも適度な柔らかさを有することによって現像剤における外添剤の埋まり込みを防止できるものが適当とされ、例えば、シリコンゴムによって構成された層厚規制ブレードを使用することが考えられている。このように、層厚規制ブレードをシリコンゴムによって構成した場合、正極性の現像剤も負極性の現像剤も良好にかつ均一に帯電させることができ、更に、現像剤母粒子への外添剤の埋まり込みを防止してその現像剤の流動性を良好に確保することができる。このため、印字にカブリやがさつきのない良好な画像を形成することができる。

## 【0004】

【発明が解決しようとする課題】ところが、シリコンゴムは磨耗し易く、トナー等の現像剤に接触してその現像剤を摩擦帯電させている間に容易に磨耗してしまう。特に、現像剤の流動性を維持するために、現像剤母粒子に埋まり込みにくい窒素吸着による BET 比表面積が  $100 \text{ m}^2/\text{g}$  未満の大きい外添剤を使用した場合、シリ



コーンゴムの磨耗が早く、層厚規制ブレードの寿命が短くなる。また、層厚規制ブレードは、感光ドラム等の静電潜像担持体、及び現像ローラ等の現像手段と一体化されて一つのカートリッジを構成しているため、層厚規制ブレードの磨耗時にはそのカートリッジごと交換しなければならない。このため、この種の画像形成装置ではランニングコストが高くなっていた。

【0005】そこで、本発明は、層厚規制手段をシリコーンゴムを用いて構成することによって良好な画像を形成すると共に、ランニングコストを良好に低減することのできる画像形成装置を提供することを目的としてなされた。

【0006】

【課題を解決するための手段及び発明の効果】上記目的を達するためになされた請求項1記載の発明は、表面に静電潜像が形成される静電潜像担持体と、該静電潜像担持体の表面に現像剤を搬送して上記静電潜像を現像する現像手段と、該現像手段の表面に付着して上記静電潜像担持体の表面まで搬送される上記現像剤に接触して、その現像剤の層厚を規制する層厚規制手段と、を備え、上記静電潜像を現像した現像剤を被記録媒体に転写して画像を形成する画像形成装置であって、上記層厚規制手段の少なくとも上記現像剤と接触する部分をシリコーンゴムによって構成すると共に、上記現像剤を重合トナーによって構成したことを特徴としている。

【0007】このように構成された本発明では、層厚規制手段の少なくとも現像剤と接触する部分をシリコーンゴムによって構成しているため、前述のように現像剤を良好にかつ均一に帯電させると共に現像剤の流動性も良好に確保することができ、印字にカブリやがさつきのない良好な画像を形成することができる。また、本発明では、現像剤を重合トナーによって構成している。重合トナーは、他の粉砕トナー等に比べて極めて球状に近く、極めて良好な流動性を有すると考えられる。このため、シリコーンゴムが前述のように磨耗するのを良好に抑制することができ、画像形成装置のランニングコストを良好に低減することができる。従って、本発明の画像形成装置では、良好な画像を形成すると共に、ランニングコストを良好に低減することができる。

【0008】なお、上記重合トナーが懸濁重合によって得られた懸濁重合トナーである場合、更に次のような効果が生じる。懸濁重合によって得られた懸濁重合トナーは、重合トナーの内でも一層球状に近く、一層良好な流動性を有すると考えられる。従って、この場合、シリコーンゴムの磨耗を一層良好に抑制して、画像形成装置のランニングコストを一層良好に低減することができる。

【0009】請求項2記載の発明は、請求項1記載の構成に加え、上記現像剤に粒径の異なる少なくとも2種類の外添剤を添加し、かつ、粒径の大きい側の上記外添剤に関わる窒素吸着によるBET比表面積が $100\text{ m}^2/\text{g}$

g未満であることを特徴としている。

【0010】本発明では、現像剤に粒径の異なる少なくとも2種類の外添剤を添加している。このため、大きい側の外添剤がスペーサとして機能することにより、その大きい側の外添剤と同一の現像剤に添加された小さい側の外添剤に他の現像剤が直接接触するのを防止して、その小さい側の外添剤が現像剤に埋まり込むのを抑制することができる。また、大きい側の外添剤は、窒素吸着によるBET比表面積が $100\text{ m}^2/\text{g}$ 未満であるため、上記埋まり込みを抑制する機能が一層良好に発揮され、現像剤の流動性を一層良好に確保することができる。前述のように、従来は、このように大きな外添剤を使用することは、シリコーンゴムの磨耗が早くなるため困難であったが、本発明では、前述のように重合トナーを使用して上記磨耗を抑制したため、このように大きな外添剤を使用することが可能となった。

【0011】従って、本発明では、請求項1記載の発明の効果に加えて、一層良好な画像を形成することができるといった効果が生じる。請求項3記載の発明は、請求項1または2記載の構成に加え、上記現像手段及び上記層厚規制手段を、未使用の上記現像剤を保持する現像剤保持手段と共に一体のカートリッジに収納すると共に、該カートリッジを、上記静電潜像担持体とは別体に交換可能に構成したことを特徴としている。

【0012】本発明では、層厚規制手段を、未使用の現像剤を保持する現像剤保持手段及び上記現像手段と共に一体のカートリッジに収納しており、このカートリッジは、静電潜像担持体とは別体に交換可能である。このため、仮に層厚規制手段が磨耗しても、この層厚規制手段を現像剤と共に新たなものに交換することができ、しかも、静電潜像担持体はそれまで使用してきたものを引き続き使用することができる。よって、層厚規制手段が磨耗した場合にもその交換が容易であり、しかも、引き続き使用可能な静電潜像担持体まで交換してしまうこともない。

【0013】従って、本発明では、請求項1または2記載の発明の効果に加えて、層厚規制手段の交換を容易にすると共に、ランニングコストを一層良好に低減することができるといった効果が生じる。請求項4記載の発明は、表面に静電潜像が形成される静電潜像担持体と、該静電潜像担持体の表面に現像剤を搬送して上記静電潜像を現像する現像手段と、該現像手段の表面に付着して上記静電潜像担持体の表面まで搬送される上記現像剤に接触して、その現像剤の層厚を規制する層厚規制手段と、を備え、上記静電潜像を現像した現像剤を被記録媒体に転写して画像を形成する画像形成装置であって、上記層厚規制手段の少なくとも上記現像剤と接触する部分をシリコーンゴムによって構成すると共に、上記現像手段及び上記層厚規制手段を、未使用の上記現像剤を保持する現像剤保持手段と共に一体のカートリッジに収納し、か

つ、該カートリッジを、上記静電潜像担持体とは別体に交換可能に構成したことを特徴としている。

【0014】このように構成された本発明では、層厚規制手段の少なくとも現像剤と接触する部分をシリコンゴムによって構成しているため、前述のように現像剤を良好にかつ均一に帯電させると共に現像剤の流動性も良好に確保することができ、印字にカブリやがさつきのない良好な画像を形成することができる。また、本発明では、層厚規制手段を、未使用の現像剤を保持する現像剤保持手段、及び、静電潜像担持体の表面に現像剤を搬送する現像手段と共に一体のカートリッジに収納しており、このカートリッジは、静電潜像担持体とは別体に交換可能である。このため、層厚規制手段が磨耗しても、この層厚規制手段を現像剤と共に新たなものに交換することができ、しかも、静電潜像担持体はそれまで使用してきたものを引き続き使用することができる。

【0015】従って、本発明では、層厚規制手段が磨耗した場合にもその交換が容易であり、しかも、引き続き使用可能な静電潜像担持体まで交換してしまうことがないので画像形成装置のランニングコストを良好に低減することができる。すなわち、本発明の画像形成装置では、層厚規制手段をシリコンゴムを用いて構成することによって良好な画像を形成すると共に、ランニングコストを良好に低減することができる。

【0016】請求項5記載の発明は、画像形成装置の静電潜像担持体の表面に現像剤を搬送してその静電潜像を現像する現像手段と、該現像手段の表面に付着して上記静電潜像担持体の表面まで搬送される上記現像剤に接触して、その現像剤の層厚を規制する層厚規制手段と、を備えた現像カートリッジであって、上記現像手段及び上記層厚規制手段を、未使用の上記現像剤を保持する現像剤保持手段と共に一体に収納すると共に、上記画像形成装置に対して、上記静電潜像担持体とは別体に交換可能に構成され、かつ、上記層厚規制手段の少なくとも上記現像剤と接触する部分をシリコンゴムによって構成したことを特徴としている。

【0017】このように構成された本発明は、画像形成装置の静電潜像担持体の表面に現像剤を搬送してその静電潜像を現像する現像手段と、その現像手段の表面に付着して上記静電潜像担持体の表面まで搬送される現像剤に接触してその現像剤の層厚を規制する層厚規制手段とを、未使用の上記現像剤を保持する現像剤保持手段と共に一体に収納している。また、本発明は、上記画像形成装置に対して、上記静電潜像担持体とは別体に交換可能に構成され、しかも、層厚規制手段の少なくとも現像剤と接触する部分がシリコンゴムによって構成されている。

【0018】このため、本発明は請求項4記載の画像形成装置に対する交換用カートリッジとして良好に使用することができる。従って、本発明を請求項4記載の発明

と組み合わせて使用すれば、請求項4記載の発明の効果が一層顕著に発揮される。

【0019】

【発明の実施の形態】次に、本発明の実施の形態を、図面と共に説明する。図1は、本発明が適用された画像形成装置としてのレーザプリンタ1の構成を概略的に表す断面図である。このレーザプリンタ1は、図1に示すように、本体ケース2の底部に被記録媒体としての用紙Pを供給するフィーダユニット20を備えている。フィーダユニット20は、用紙Pを積層保持する用紙押圧板22と、その積層保持された用紙Pの供給を行う給紙ローラ23と、用紙押圧板22をその給紙ローラ23に向けて付勢する圧縮バネ22aとを備え、用紙押圧板22に積層保持された最上位の用紙Pを所定のタイミングで供給する。

【0020】給紙ローラ23の用紙搬送方向下流側には、一対のレジストローラ24a、24bが回転可能に設けられ、後述する感光ドラム25と転写ローラ32とによって形成される転写位置へ所定のタイミングで用紙Pを搬送する。静電潜像担持体としての感光ドラム25は、正帯電性の材料、例えば、正帯電性のポリカーボネイトを主成分とする有機感光体からなる。本実施の形態では、円筒状でアルミ製の円筒スリーブの外周に、ポリカーボネイトに光導電性樹脂を分散させた所定厚さ（例えば約20μm）の光導電層を形成することによって感光ドラム25を構成した。感光ドラム25には帯電器26が対向配置され、その感光ドラム25の回転方向下流側にはレーザスキャナユニット27からのレーザ光Lが照射される。

【0021】帯電器26は、例えばタングステン等からなる帯電用ワイヤからコロナ放電を発生させる正帯電用のスコトロロン型帯電器であり、感光ドラム25の表面を正に帯電させる。また、レーザスキャナユニット27は、図示しないレーザ発生器が発生したレーザ光Lを反射しながら回転駆動されるポリゴンミラー（5面体ミラー）28と、一対のレンズ30a、30bと、一対のミラー31a、31bとを備え、形成すべき画像に応じて感光ドラム25の表面をレーザ光Lで走査露光する。このようにして、帯電器26とレーザスキャナユニット27との共働により感光ドラム25に静電潜像が形成されると、その静電潜像は、後述の現像器カートリッジ50（後述のように、請求項5記載の現像カートリッジに相当）から供給される現像剤としてのトナーTによって現像される。そして、このトナーTが、感光ドラム25と転写ローラ32との間の上記転写位置まで搬送された用紙Pに転写されることにより、用紙Pに画像が形成される。

【0022】画像形成後の用紙Pは、加熱用ローラ33と押圧ローラ34とに挟まれて上記トナーTによる画像を定着された後、一対の搬送ローラ35a、35b、及

び一对の排紙ローラ36a, 36bによって搬送され、本体ケース2の上面に設けられた排紙トレイ37に排出される。

【0023】次に、現像器カートリッジ50の構成について、図2の拡大図を用いて説明する。図2に示すように、現像器カートリッジ50は、ケース52内に現像剤保持手段としてのトナー収容室53が形成され、そのトナー収容室53内には、トナーTを攪拌するアジテータ54と、正帯電性の非磁性1成分現像剤としてのトナーTが収容されている。トナー収容室53の隣側には、現像を行う現像室55が形成され、その現像室55内には、供給ローラ56と現像手段としての現像ローラ57(φ16mm)とが回転可能に設けられている。トナー収容室53から供給ローラ56を介して現像ローラ57の表面に搬送されたトナーTは、層厚規制手段としての層厚規制ブレード60により所定の層厚に規制された後、図1に示す感光ドラム25の表面に搬送されて現像に供される。

【0024】なお、層厚規制ブレード60は、現像ローラ57上のトナーTに直接接触する押圧部材61と、その押圧部材61を所定の圧力で現像ローラ57に圧接する板バネ62とによって構成されている。本実施の形態では、板バネ62を厚さ0.1mmのSUS板によって構成し、押圧部材61を直径3.5mmの半円形断面を有するシリコンゴムによって構成した。また、本実施の形態では、現像器カートリッジ50を感光ドラム25とは別体に交換可能に構成した。

【0025】このように構成されたレーザープリンタ1では、感光ドラム25の表面まで搬送されるトナーTには、層厚規制ブレード60の押圧部材61が接触してトナーTの層厚を規制する。また、この押圧部材61の接触によってトナーTが帯電し、感光ドラム25に形成された上記静電潜像に対して静電引力によって付着する。このため、上記静電潜像に均一な厚さでトナーTを付着させ、それを用紙Pに転写して鮮明な画像を形成することが可能となる。

【0026】また、押圧部材61を構成するシリコンゴムは、トナーTに対する帯電性が優れ、しかも適度な柔らかさを有することによってトナーTにおける外添剤の埋まり込みを防止することができる。このため、トナーTを良好にかつ均一に帯電させると共に、トナーTの流動性を良好に確保することができる。従って、レーザープリンタ1では、印字にカブリやがさつきのない極めて良好な画像を形成することができる。

【0027】但し、シリコンゴムは磨耗し易い。そこで、本実施の形態では、トナーTとして、スチレンア

リル重合トナーを使用した。重合トナーは、他の粉碎トナー等と比べて極めて球状に近く、極めて良好な流動性を有すると考えられる。また、スチレンアクリル重合トナーのように懸濁重合によって得られた懸濁重合トナーは、重合トナーの内でも一層球状に近く、一層良好な流動性を有すると考えられる。このため、本実施の形態では、押圧部材61を構成するシリコンゴムが磨耗するのを良好に抑制することができ、レーザープリンタ1のランニングコストを良好に低減することができる。

【0028】また、本実施の形態では、トナーTに粒径の異なる2種類の外添剤を添加し、粒径の大きい側の外添剤として、窒素吸着によるBET比表面積が $100\text{m}^2/\text{g}$ 未満(例えば $50\text{m}^2/\text{g}$ )の比較的大きい外添剤を添加した。ここで、粒径の異なる2種類の外添剤を添加する効果について説明する。図3に示すように、大きい側の外添剤91は、スペーサとして機能することにより、その外添剤91と同一のトナー母粒子95に添加された小さい側の外添剤93に他のトナー母粒子95が直接接触するのを防止して、その小さい側の外添剤93がトナー母粒子95に埋まり込むのを抑制する。

【0029】しかも、大きい側の外添剤として窒素吸着によるBET比表面積が $100\text{m}^2/\text{g}$ 未満のものを使用した場合、上記埋まり込みを抑制する機能が一層良好に発揮され、トナーTの流動性を一層良好に確保することができる。前述のように、従来は、このように大きな外添剤を使用することは、シリコンゴムの磨耗が早くなるため困難であったが、本実施の形態では、前述のようにスチレンアクリル重合トナーを使用して上記磨耗を抑制したため、このように大きな外添剤を使用することが可能となった。また、たとえ磨耗が起こっても、後述のように押圧部材61は容易に交換することができる。従って、レーザープリンタ1では、極めて良好な画像を形成することができる。

【0030】ここで、トナーTとして粉碎トナーを使用した比較例の画質、及び、外添剤の大きさを種々に変更した場合の画質を表1に示す。なお、表1に示すデータは、トナー母粒子をいずれの場合も平均粒径 $9\mu\text{m}$ とし、外添剤としてシリカを使用した実験によって得られたものである。また、実験では、30秒に1枚印字するという間欠印字で、印字面積4%の全面パターンを印字した。トナーは、初期に300g入れ、10000枚印字終了毎に250g追加して実験を行った。トナー消費量は、おおよそ1000枚当たり50gであった。

【0031】

【表1】



(7)

特開 2000-275963

11

12

…トナー母粒子

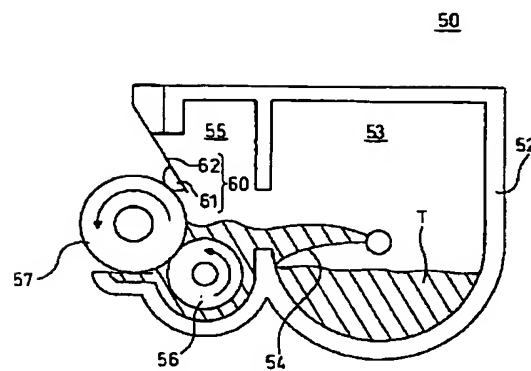
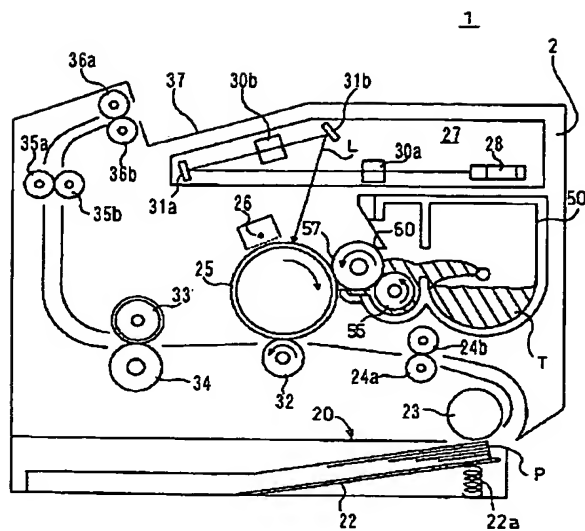
\* \* L…レーザ光

P…用紙

T…トナー

【図 1】

【図 2】



【図 3】

